The Impact of COCOM and US Embargoes of Petroleum Equipment Exports

A total, effective and sustained multilateral COCOM embargo on exports of oil and gas equipment to the USSR and Eastern Europe would substantially retard Soviet energy development, and its impact would increase over at least the next decade. The impact of a unilateral U.S. embargo would be much smaller and transitory.

The most severe effect of a COCOM embargo would be on Soviet gas production. Construction of gas pipelines, the chief constraint on Soviet ability to expand gas production, depends heavily on imports of Western pipe and compressors, and Soviet capabilities for producing such equipment are already stretched to the limit. Without Western equipment a shortfall of at least 15 percent of planned gas production by 1985 would be almost inevitable. The shortfall would continue to increase later in the decade even though Moscow would give a high priority to expansion of its own pipe and compressor industry. A unilateral U.S. embargo would have virtually no effect on Soviet gas production.

In the case of oil, the most critical short term Soviet dependence is for US built submersible pumps, production of which is now a US monopoly. Denial of these pumps could cut Soviet oil production by around 2 percent over the next 2 years or so. Beyond that period, the impact would continue to increase with a COCOM embargo, but would quickly disappear with a unilateral US embargo as other Western producers entered the field.

As time goes on, Soviet dependence on Western oil equipment will increase, reflecting the rapidly growing complexity of oil exploration and development and the limitations of Soviet technology. Finding the smaller and more remote deposits on which Soviet oil production will increasingly depend, developing offshore fields, and expanding the use of enhanced oil recovery all will benefit greatly from--and in some cases will require--Western equipment. Although quantification is not possible, there is little doubt that a COCOM embargo would substantially accelerate the expected decline in Soviet oil production in the second half of the 1980s and beyond.

In turn, a more rapid decline in oil production coupled with a much smaller increase in gas production than is now expected would have an important depressing effect on the Soviet economy. Hard currency earnings would fall sharply, thus greatly curtailing Soviet imports from the West. And economic growth would be even slower than the 2 percent or less rate we now expect.

The judgments of this paper are necessarily tentative because of the absence of information on specific Soviet plans, equipment production and inventories, and oil- and gas-field conditions. Nor can we foresee the long-term adjustment possibilities available to a large command economy. The basis for our conclusions is presented in the accompanying Annex, in which the ranges of impact on production shown for various types of equipment are probably more valid in reflecting relative rather than absolute magnitudes. The aggregate of the individual effects thus at best provides an order of magnitude impression, based on the best current judgments of our petroleum analysts.

ANNEX

Preliminary Judgments on the Impact of COCOM and US Embargo of Oil and Gas Equipment to the USSR

Background

Estimates of the effects of a Western embargo on the export of various kinds of oil and gas equipment to the Soviet Union are necessarily tenuous, as they involve assumptions as to the types and quantities of equipment that the Soviets will seek from the West in the next few years. In the past, imports from the West represented only a small percentage of total Soviet equipment supply. But new problems in exploration, production, and transport of oil and gas will probably lead the USSR to rely more heavily on imports in the 1980s. Although the Soviets show no inclination to avail themselves of opportunities they have ignored in the past, arrangements such as joint ventures or service contracts with Western firms could--under changed circumstances--offer productivity increases in petroleum extraction.

Effect of Embargo on Major Categories of Equipment

Exploration Equipment

The Soviets already have found most of the relatively shallow, easily-located, accessible oil and gas traps. They specifically need Western seismic and well-logging technology to boost oil reserves in the 1980s. Due to the 5 to 6 year discovery-to-production time lag, Western equipment ordered today is unlikely to have much impact on oil production before the late 1980s. While a multilateral embargo could severely constrain Soviet exploration, unilateral controls by the US would have little or no effect. Foreign firms can supply Soviet needs with little or no degradation in quality. But we do not believe that the Soviets can improve their own exploration technology (i.e., geophysical hardware and software) rapidly enough to affect production before the 1990s.

Drilling Equipment

The Soviets plan to nearly double the amount of drilling for oil and gas in 1981-85, with further increases planned for the late 1980s. Soviet drilling productivity is poor by international standards. Western rigs, drill pipe, tool joints, drill bits, blow-out preventors, and drilling-fluid technology already provide substantial aid to Soviet drilling efforts. The Dresser drill-bit plant, if brought on stream with US or Western assistance, could have a considerable impact on Soviet oil

production by the late 1980s. Although the US is the world's leader in the production of drilling equipment, producers in Japan and Western Europe could supply the Soviet market. A unilateral US embargo would therefore not have much bite.

Production Equipment

The Soviet oil industry faces rising fluid-lift requirements in the 1980s, as the amount of water produced along with the oil increases. According to Soviet plans, a large additional volume of fluid--perhaps as high as 6 million b/d--must be lifted in 1985 simply to maintain oil production at the 1980 level of about 12 million b/d. To handle the high volume of fluid, the Soviets plan to double the number of wells producing with the help of submersible pumps and gas-lift equipment.

Imported equipment is important for this effort because the capacity and quality of Soviet-made submersible pumps and gas-lift equipment is low. In the case of high capacity pumps, U.S. producers now have a monopoly but, if these were embargoed, other Western suppliers could be expected to enter the field within about two years. Each high-capacity U.S. pump produces on the average about 1,000 to 1,500 b/d of oil under Soviet conditions. The Soviets probably expect to import about 100 such pumps annually (in the 1970's they imported a total of 1,200). The water-cut problem in Soviet oilfields is getting worse, and domestic development of a good substitute pump has not yet been successful. Denial of the U.S. pumps consequently could cost the Soviets 200,000 to 300,000 b/d of oil before other Western suppliers could come on stream. In the case of a COCOM embargo, the impact would continue to grow, probably for several more years.

In addition to high capacity pumps, Western equipment playing a significant role in Soviet oil development includes gas-lift equipment, well-completion equipment, wellhead units, and Christmas-tree assemblies.

The USSR also has an increasing need for Western enhanced-oil-recovery technology. Enhanced recovery projects have long lead times, however, and the effect of Western assistance would be relatively small and felt only after 1985.

Offshore Equipment

The Soviets' least-explored prospective areas for new petroleum discovery are offshore, and their oil and gas production in the late 1980s and beyond heavily depends on the development of such areas. The Soviets already have received substantial assistance from the West. Continued assistance could speed development in the Caspian area. A US embargo applied unilaterally would make little difference. After 1985, COCOM restrictions would have very little effect. Firms in Finland,

Singapore, Mexico, and Yugoslovia can supply most of the USSR's current offshore needs, and all of their requirements by the late 1980s. Production of the few drilling components now produced only in the US could be quickly introduced abroad.

Oil Refining and Gas Processing Equipment

The Soviets intends to expand their secondary refining and gas processing industries substantially in the 1980s. They are relying almost exclusively, however, on their own production or on equipment imported from Eastern Europe.

Gas Pipeline Equipment

Although the Soviet Bloc produces most of its own oil pipeline equipment, the USSR relies extensively on the West for gas pipeline equipment--large-diameter pipe and valves, compressors, and pipelayers. Since pipelines are the principal bottleneck in Soviet gas production, a COCOM embarog on pipe, compressors, and pipelayers would be a major setback to the Soviet gas industry. High-quality large-diameter pipes and valves are currently produced only in Western Europe and Japan.* Although the Soviets have recently built a plant to manufacture large-diameter pipe, they have yet to master production of pipe of this size. Pipelayers capable of handling this pipe are produced only in the US, Italy and Japan. Large turbine compressors of the type sought by the Soviets for the export pipeline project are built in the United States and the United Kingdom. Smaller units are built by firms in France, Germany, Italy, and Japan; none of these, however, has yet attempted to make a 20 to 25 MW unit, although a French firm has the necessary licensing.

A multilateral COCOM embargo on gas pipeline equipment could reduce gas production by as much as 10 billion cu. ft./day (1.75m b/d, oil equivalent) in 1985 and by substantially more after 1985. US unilateral restrictions on equipment in this area, however, would have minimal impact. The US does not produce the pipe or valves sought by the USSR, and pipelayers and compressors can be supplied from abroad. Foreign production of industrial compressor turbine shafts and blades, the sole area now subject to US control, could begin in sufficient time to prevent a delay in completion of the pipeline.

* Although the Soviets produce pipe up to 1,420 mm. (56 inches) in diameter, little is for natural gas pipeline service. Most Soviet pipe is spiral welded and lacks the (HSLA) high-strength, low alloy metallurgy of Western steel for Arctic pipeline service. Most of the large pipe imported by the USSR is fabricated with a single longitudinal weld made by the submerged arc process.

Implications of an Embargo on Equipment for the Yamal Pipeline

A full COCOM embargo on equipment for Siberia-to-Europe gas pipeline presupposes West European agreement to abandon the project. A unilateral US embargo on critical gas turbine components destined for use on the Yamal Pipeline probably would not substantially delay the project.

(a) The Soviets have designed the export pipeline compressor stations to use either General Electric (GE) or Rolls-Royce (United Kingdom) turbines, and a US embargo on GE could prompt Moscow immediately to switch to Rolls-Royce, which probably can produce the needed turbines roughly within the time sought by the Soviets.

(b) Even if the Soviets stay with the GE design and thus receive complete delivery from West European firms of turbine-compressor units two years later than without the embargo on GE, the pipeline probably would not be seriously delayed beyond the full-capacity completion date we now expect--late 1986 to early 1987. The Soviets would take at least 5 years to build the pipeline and complete all of the compressor stations even without an embargo on GE exports. Thus many turbine-compressor units, even if delivered by late 1983 as Moscow wants, would have to wait several years before installment in compressor stations. If West European delivery of the GE-design turbines were not completed until late 1985, the Soviets could still bring the pipeline to full capacity within another year by placing those late-arriving units into the last compressor stations to be completed.

(c) Because of likely slippage of construction schedules on the Soviet side, even a substantial delay in delivery of Rolls-Royce turbines (beyond the late-1983 to early-1984 deadline now seen as feasible if Moscow switches soon to that firm) probably would not delay the completion of the pipeline project.

Economic Impact of Export Controls

A sustained multilateral embargo on exports of energy-related equipment to the USSR could lead not only to substantial effects on oil and gas production but also to a significant worsening of already poor economic prospects. The losses in gas and oil production would probably amount to 2 - 3 million b/d (oil equivalent) in the mid and late 1980's, of which the longer part would be gas.

Part of this short-fall in energy production--perhaps of the order of 1 million b/d--would be absorbed through cuts in exports

of oil and gas to the West and Eastern Europe. Exports of oil and gas account for about one half of present Soviet hard currency earnings.

Even after major trade adjustments, domestic energy supplies would probably be reduced by 1 - 2 million b/d, or some 5% by the mid to late 1980's.

The average annual growth of GNP in the 1980's (now projected at around 2 percent) probably would be lowered by half a percentage point or so. As time went on, the USSR would adjust to an embargo through cutbacks in imports from the West, stepped-up domestic production of oil and gas equipment, and forced conservation, as well as through slower economic growth.